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EP 0692759 A2

EP 0507269 A2

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EP 0413606 A2

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US 5294792 A

US 5247137 A

(58) Field of Search

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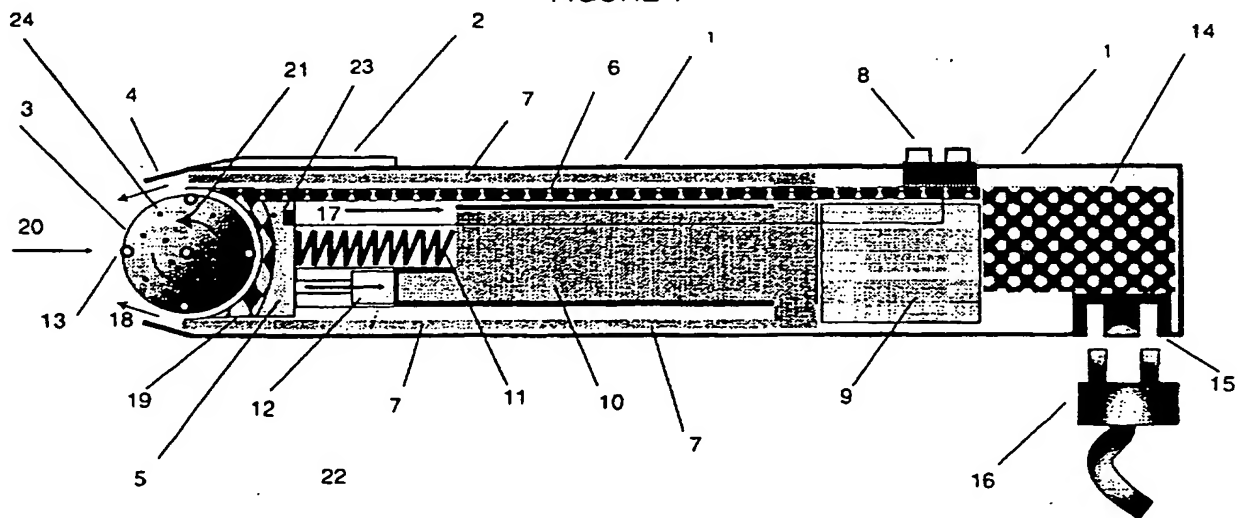
Online databases: EPODOC, JAPIO, WPI

(54) Abstract Title

Digital ballpoint pen with motion sensing of ball and ink supply

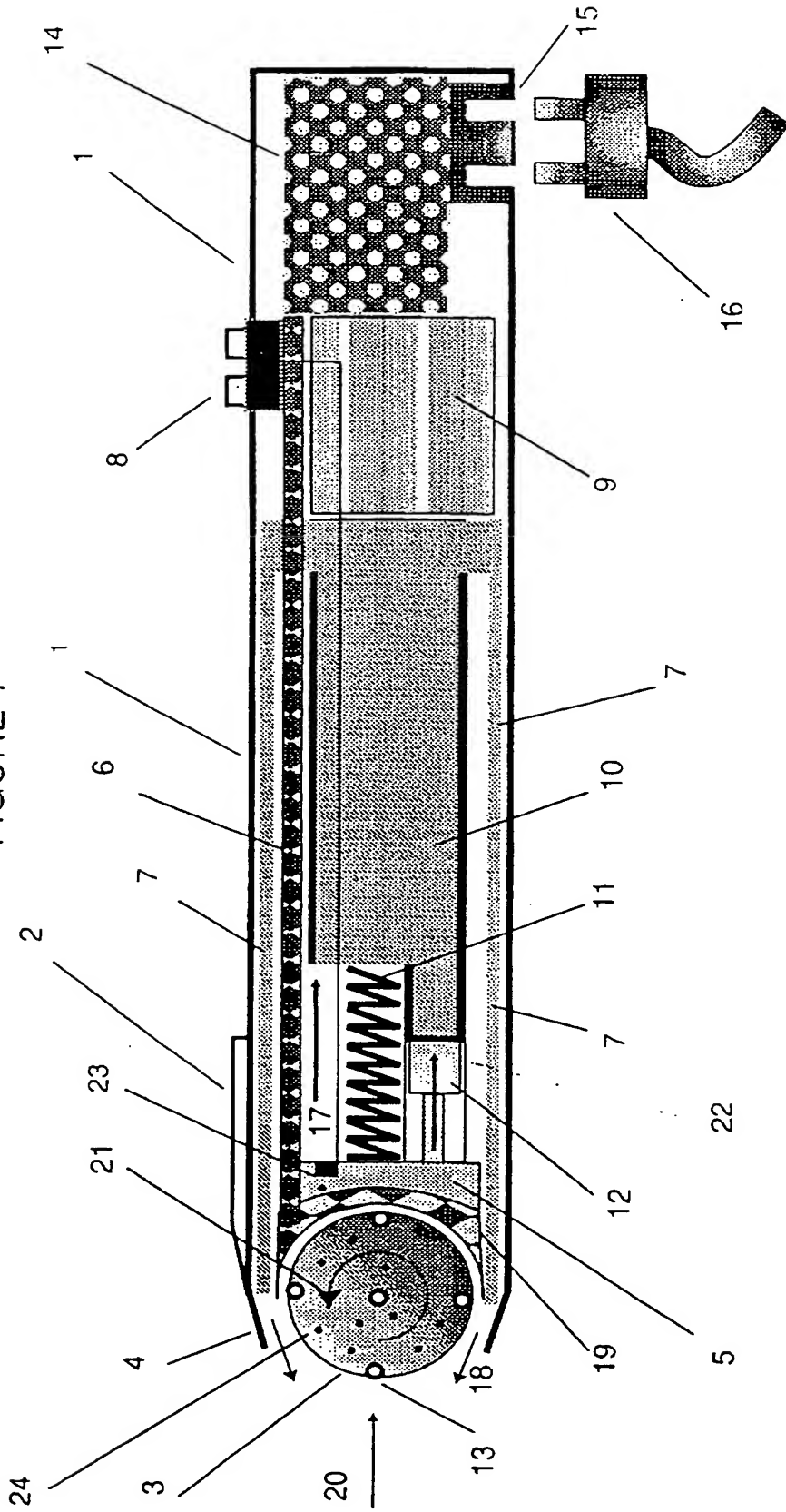
(57) The pen includes a sensor for recording the motion of the ball 3 and stores the information digitally in an electronic storage device 14 that may be removable, a socket 15 providing connection via a cable to other digital devices. The surface of the ball 3 includes spaced metal or magnetic nodes 13 that are detected by electronic or electrical motion contacts or receptors 19. The pen also includes an ink reservoir 10 with a piston 12 for feeding ink along channel 7 to the ball.

FIGURE 1



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FIGURE 1



## Digital Memory Pen

This invention relates to a Digital Memory Pen

It is often a requirement that information be recorded or notes be taken in a form that would be usefully transferred to a digital memory at some future point. Personal organisers with a pen and writing programme with screen for example the 'Apple Newton' provide such options.

However, the memory and processing power of such hand-held and portable systems is limited. And in addition the carrying of the systems themselves may be inconvenient due to their size and weight and the need to open and access them and their relevant programmes in inconvenient situations.

The present invention seeks to answer these problems by the creation of a digital pen that requires no special additional pad or organiser where the pen itself may act as a conventional recorder via the use of an ink flow or lead nib, but also records within itself the motions of the nib/ball in digital form so as to form a record that is then transferable later via an interface such as a personal computer into a programme that may recognise the record therein and allow it to be both recorded and digitally manipulated as required.

According to the present invention there is provided a Digital Memory Pen consisting of a hollow pen shaft with an open end within which and semi-protruding from which is a freely rotatable ink ball so sized and situated as to fit closely within the said open end and having on its surface a number of embedded inserted or otherwise attached points studs nodes or discrete component units having a electronically/electrically monitorable character for example magnetised or of metallic material such nodes being distributed across the surface of the ball in regular or irregular pattern such that each quarter sphere of the ball contains several.

In addition the said invention provides that contained within the pen shaft directly behind the ink ball is positioned a motion receptor unit having a concave face whose curvature and dimensions mirror or compliment those of the ink ball whilst being of such dimension as to snugly harbour and contain the ink ball within its concave curvature such that the two surfaces are retained in slidable close contact.

The said concave faced motion receptor unit being so constructed as to have embedded or otherwise fixed in or upon the inner surface of its concave face an array of closely spaced contact or receptors points.

Such receptor points being so constructed as to be attuned responsive and receptive to the points or nodes or similar components comprising incremental segments on the surface of the ink ball such that when the ink ball rotates within the sphere of the concave face of the motion receptor unit the said points studs nodes or similar components distributed about the face of the ink ball may in passing generate or make a discernible distinct contact or connection with individual receptors points of the motion receptor unit.

Such passing connection as described when the ink ball in motion being dynamic progressive sequential and intermittent as the individually spaced studs or ink ball nodes pass in turn across the concave face of the receptor unit. Each stud or ink ball node thereby making a sequential connection and/or signal whilst in contact or connection with one or more of the closely arrayed receptors.

Such contact being in direct accordance with and conforming to the motion of the outer face of the pen ball when pressed and rolled in use creating lettering and the like upon a given writing surface.

The invention further provides that where the studs or points or similar components fixed in or upon the face of the ink ball contact or connect in passing with the arrayed receptors in the motion receptor unit such connection or contact may generate a signal or pulse or other similar energy interchange such process being continuous sequential and accumulative and thereby generating a stream of data effectively recording and monitoring the direction and velocity of the rotation of the ink ball while in use on a given writing or other surface.

Such data regarding the velocity and directional motion of the ink ball as generated and registered or received by the concave motion receptor unit thereafter being transferable via a connected cable link or other convenient data transfer system from the receptor unit to a digital recording/ storage device also within the body of the pen shaft.

Such digital recording/ storage device being for example a micro-chip or other active digital data recording/ storage system as used for example in miniature voice recording equipment such as memo pens or the like. Such digital recording/storage device being removable and replaceable to facilitate data transfer or storage.

Power for the process hereby described being provided via an integral battery contained within or upon the pen shaft or other convenient power/energy source such as an external charging unit within which the pen is stored or placed when not in use or solar power generated via cells in or on the pen shaft. Such source being when required replaceable or rechargeable or self-charging.

In addition the present invention provides that the said ink ball be optionally held in a forwards position within the narrowed open end of the pen shaft by a spring or tensioner or similar device such that when pressed against a given writing or other surface the ink ball and closely contacted motion receptor unit may thereby be pressed backwards within the pen shaft body to a sufficient degree to optionally operate a switch electric or electronic or otherwise thereby activating or otherwise engaging a given energy source and providing power permitting generated data to be transmitted from the ink ball and receptor unit to the receiving micro-chip or other storage device. Such switch as described being optionally external to the mechanism and activated independently by the operator. Such switch being further via it's on/off depressed/released mode indicative of interruption in the use of the pen.

Such pressure upon the ink ball and contacted motion receptor unit as described being of moderate and calibrated pressure such that when the pen is applied to a given writing surface for use, the ball may freely retain rotary motion in all directions.



In addition the invention provides that pressure upon the ink ball when pressed against a given writing or other receptor surface may optionally act to generate a piston/ hydraulic/ pneumatic vacuum or similar pressure within the pen shaft and act upon a connected reservoir of ink also contained within the pen shaft such that the ink may then flow onto or around the ink ball or otherwise be extruded and delivered onto a given writing surface such as to provide a means of generating a line or mark for the purpose of writing or drawing or otherwise generating a visible trace upon a given material.

Such process as described in providing a flow of ink onto a given surface when pressure is provided upon the ink ball by contact with such surface optionally operating in tangent with or as an alternative to other methods of ink delivery onto a given surface for example where the said ink or similar substance may flow onto or around the ink ball or directly onto a chosen receptor surface by osmosis or atmospheric pressure or other system or systems in common use in the delivery of such writing or marking substances as ink and the like when used to create a mark or line upon a writeable or receptive material.

Such system of generating the said mark or line being optionally variable where required such that the ink channels or delivery system may be replaced by other integrated methods of generating marks or writing or the like for example lead/crayon/charcoal or other established material.

The present invention further provides that the said Data Memory Pen contain within its structure an interface or other means of connection or interaction with other digital devices for example a plug and socket connection or infra-red transfer system and/or other readily available industry standard data transfer technology or other connector system remote or direct, not excluding the physical transfer of data in the form of a portable memory unit such as a flash card or similar device contained within the pen structure and conveniently removable.

Such interface as above described providing means whereby information and data recorded/ monitored or otherwise acquired by the Data Memory Pen may then be relayed or conducted or transmitted to a further recording or receiving digital data device.

Such further device being for example personal computers organisers and the like wherein such further devices as mentioned or others may be employed to accept data created recorded stored or otherwise generated by the Data Memory Pen and may thereafter themselves store manipulate transmit or otherwise use such data within the parameters of appropriate software programmes such as handwriting/drawing recognition software or other data management systems.

Such software and similar means whether dedicated or general being then employed to exploit the said data as convenient.

The present invention also provides that the ink ball may have a specially patterned surface to assist its even and dependable rotation and motion when in use such surface being for example patterned or textured thereby providing friction against variable writing/drawing or other surfaces and thereby assisting accurate rotation in relation to use.

In addition the present invention provides that a given linear side of the external structure of the Data Memory Pen be optionally marked configured or otherwise indicated so as to provide a given user or operator with an indication of the up-side or the pen, such as to facilitate orientation in use and thereafter interpretation of co-ordinates and generated data in the subsequent use of such in respect of the horizontal or vertical axis of the Digital pen when in use on a given surface.

A specific embodiment of the invention will now be described by way of reference to the accompanying non-scaled drawings in which —

Figure 1

Shows the pen mechanism in cut away side view

Referring to the drawings -

The Data Memory Pen comprises a pen shaft 1 with ridge along one side denoting its top or upside 2 and a narrowed front opening 4. Within the pen shaft opening 4 is contained a freely rotatable ink flow ball 3 having distributed on its surface a number of spaced metal/magnetic nodes 13. Within the pen shaft behind and partly enclosing the ink ball is situated a motion receptor device 5 having a concave face in which is embedded an array/pattern of electronic/electrical contacts 19 connected via a cable 6 to a digital storage micro-chip 14. A source of power for operation and data transfer/storage being provided via a battery 9 when an on/off switch 8 is activated or when pressure upon the ball activates a pressure operated switch 23 to turn the unit on.

When in use and applied to a given writing surface via downward pressure 20 the rotatable ink ball 3 revolves or rolls as indicated by the arrow 21 passing its surface nodes 13 across the inner concave face of the motion receptor 5 permitting the ink ball nodes 13 to interact and dynamically contact the embedded array of motion receptor contacts 19 generating a stream of signal data indicating the ink ball's velocity and direction of motion upon a given writing surface via a connected cable 6 to the micro-chip storage device 14. An interface comprising a socket 15 provides further onward connection from the micro-chip storage device via a connector 16 to other digital devices.

The application of ink to a given surface when in use is provided via pressure upon the ink ball 3 forcing a partial retraction of the ink ball 3 and closely adjacent motion detector 5 against a retaining pressure spring 11 in the direction indicated by the arrow 17 and forcing a connected piston 12 along a conduit 22 connected to an ink reservoir 10 thereby propelling or assisting a flow of

ink from the reservoir 10 along exit channels 7 within the casing of the pen shaft 1 and onto the face of the ink ball 3 and thereby onto a given writing surface the accurate rotation of the ink ball against such surface being assisted by a patterning of friction points on the ball's face 24.

## CLAIMS

1

A pen which is also a recording device being freely portable and having a tip which dispenses ink stored within the body of the pen wherein such tip also contains electronic or electrical or magnetic sensors such that the directional motion and velocity of the pen tip in use upon a given surface may be tracked and recorded in digital format and such information transmitted to a storage unit also within the pen body where it may be held for later retrieval or onward transmission.

2

A pen as described in Claim 1 wherein the pen tip may be ball shaped and have sensor nodes upon or within it's surface such nodes being connected to complementary sensors providing a secondary pick-up receptor unit providing onward transmission of data.

3

A Pen as described in claim 1 and claim 2 wherein the pen structure contains an integral socket or interface system permitting connection and transfer of data to secondary devices such as computers for processing deciphering or further storage.

4

A pen as described in Claim 1 and Claim 2 and Claim 3 wherein the digital storage unit may be removable to permit transfer of data or replacement with a further unit as required.

5

A pen as described in Claim 1 and Claim 2 and Claim 3 and Claim 4 wherein the pen contains an integral power source within it's body in the form of a battery or the like and such power source being both replaceable and/or re-chargable.

6

A pen as described in Claim 1 and Claim 2 and Claim 3 and Claim 4 and Claim 5 wherein the pen tip and motion sensor unit is connected to a pressure on/off switch such that use of the pen activates its motion sensor recording device and/or power source.

7

A pen as described in Claim 1 and Claim 2 and Claim 3 and Claim 4 and Claim 5 and Claim 6 wherein pressure upon the tip in use may generate pressure via a connected hydraulic or similar system to deliver ink or other marking substances via channels or conduits or other connections from an integral reservoir to a given writing surface.

8

A Pen as described in Claim 1 and Claim 2 and Claim 3 and Claim 4 and Claim 5 and Claim 6 and Claim 7 wherein the delivery of ink or other marking substance to a given writing surface may include osmosis gravity feed or other similar systems in tandem or as an alternative to a pressurised system and such systems may operate independently of or in conjunction with the data generation and recording system.



9

A Pen as described in Claim 1 and Claim 2 and Claim 3 and Claim 4 and Claim 5 and Claim 6 and Claim 7 and Claim 8

wherein the body of the pen utilises a mark or design feature indicating or otherwise communicating a given orientation in usage such as an up-side and down-side.

10

A Pen as described in Claim 1 and Claim 2 and Claim 3 and Claim 4 and Claim 5 and Claim 6 and Claim 7 and Claim 8 and Claim 9

wherein the tip may be sprung loaded via a spring or valve or tensioner or similar method such that pressure on the tip in use may engage the tip with an adjacent motion sensor unit and/or power source and ink delivery system.

11

A Pen as described in Claim 1 and Claim 2 and Claim 3 and Claim 4 and Claim 5 and Claim 6 and Claim 7 and Claim 9 and Claim 10

wherein the writing and data collection end of the pen structure may have a pressure based or independently retractable cover.

12

A Pen as described in Claim 1 and Claim 2 and Claim 3 and Claim 4 and Claim 5 and Claim 6 and Claim 7 and Claim 9 and Claim 10 and Claim 11

wherein the ink ball may have a specially patterned surface to assist its even and dependable rotation and motion when in use such surface being patterned or textured to provide friction against variable writing/drawing or other surfaces thereby assisting accurate rotation in relation to use.

1 3

A Pen as described in Claim 1 and Claim 2 and Claim 3 and Claim 4 and Claim 5 and Claim 6 and Claim 7 and Claim 9 and Claim 10 and Claim 11 and Claim 12 wherein the body of the pen utilises a mark or design feature indicating or otherwise communicating a given orientation in usage such as an up-side and down-side.

1 4

A Pen substantially as described herein with reference to figure 1 of the accompanying drawings.



Application No: GB 9911371.4  
Claims searched: 1-13

Examiner: Graham Russell  
Date of search: 7 July 1999

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q):

Int Cl (Ed.6): B43K 29/00; G06K 11/18

Other: Online: EPODOC, JAPIO, WPI

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	EP 692759 A2 (YASHIMA) see column 9 lines 3-20	1
X	EP 507269 A2 (YASHIMA) see column 5 line 52 - column 6 line 56	
A	EP 416870 A2 (MATSUSHITA) see Fig 5 & column 4 line 47 - column 5 line 24	
A	EP 413606 A2 (MATSUSHITA) see Fig 3, column 3 line 3 - column 4 line 47	
A	EP 362970 A2 (NRDC) see column 4 lines 24-25	
A	WO 98/36346 A2 (KANITECH) see Fig 4, page 7 lines 1-9 & page 8 lines 8-18	1
X	US 5294792 (TEXAS) see Fig 5, column 3 lines 6-28 & column 7 lines 48-65	
A	US 5247137 (EPPERSON) see Fig 1 & column 2 line 54 - column 3 line 2	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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